

What I claim is:

1. A method of manufacturing a semiconductor device, comprising the steps of:  
preparing an SOI substrate;  
forming a metal layer on the SOI substrate;  
5 performing a first anneal treatment to the metal layer at a relatively low temperature in order to transform the metal layer to a first silicide layer;  
forming an insulating layer on the first silicide layer; and  
forming a contact hole, which reaches the first silicide layer, in the insulating layer; and  
10 performing a second anneal treatment to the silicide layer at a relatively high temperature in order to transform the first silicide layer to a second silicide layer.
2. A method of manufacturing a semiconductor device as claim in claim 1 wherein the first anneal treatment is performed in the range between 450 °C and 550 °C.
- 15 3. A method of manufacturing a semiconductor device as claim in claim 2 wherein the insulating layer is formed under the condition in the range between 450 °C and 550 °C.
- 20 4. A method of manufacturing a semiconductor device as claim in claim 3 wherein the second anneal treatment is performed in the atmosphere around 800 °C.

5. A method of manufacturing a semiconductor device as claim in claim 1 wherein the metal layer is made of cobalt and the first silicide layer is a CoSi silicide layer.

5 6. A method of manufacturing a semiconductor device as claim in claim 5 wherein the second silicide layer is a CoSi<sub>2</sub> silicide layer.

7. A method of manufacturing a semiconductor device as claim in claim 1 wherein the metal layer is made of titanium.

10

8. A method of manufacturing a semiconductor device as claim in claim 1 wherein the contact hole is formed by using a dry etching method with the following conditions,

$C_4F_8/O_2/Ar=20/10/500$  sccm, 40mTorr, and 1600W.

15

9. A method of manufacturing a semiconductor device as claim in claim 1 wherein the contact hole is formed by using a dry etching method with the following conditions,

$CHF_3/CO=30/170$  sccm, 35mTorr, and 1600W.

20

10 A method of manufacturing a semiconductor device as claim in claim 1 wherein the SOI substrate includes a support substrate, a silicon oxide layer formed on the

support substrate and a silicon layer formed on the silicon oxide layer.

11. A method of manufacturing a semiconductor device as claim in claim 1, further including steps of

5       forming a first mask layer on the insulating layer;  
      forming an opening in the first mask layer until the insulating layer is exposed;  
      forming the second mask layer on the first mask layer and in the opening; and  
      etching the second mask layer anisotropically until the first mask layer and a  
part of the insulating layer, which is under the opening, are exposed,

10       whereby a part of the second mask layer remains at an internal wall of the  
opening as a side wall,

      wherein the contact hole is formed by using the first mask layer and the side  
wall as an etching mask.

15   12. A method of manufacturing a semiconductor device as claim in claim 11  
      wherein the first mask layer is made of poly-Si.

13. A method of manufacturing a semiconductor device as claim in claim 11  
      wherein the second mask layer is made of poly-Si.

20

14. A method of manufacturing a semiconductor device as claim in claim 11  
      wherein the first and the second mask layers are formed under the condition in the

range between 450 °C and 550 °C.

15. A method of manufacturing a semiconductor device as claim in claim 1, further including steps of:

5        forming a cap layer on the first metal layer in order to isolate the metal layer from the atmosphere at the first anneal treatment; and  
removing the cap layer after the first silicide layer is formed.

16. A method of manufacturing a semiconductor device as claim in claim 15,  
10        wherein the cap layer is made of titanium nitride.